

Hourly energy demand and prices: an analysis on risk measures and correlation

MAY 24, 2021

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Objectives

Understand how different types of energy relate with prices, demand and production.

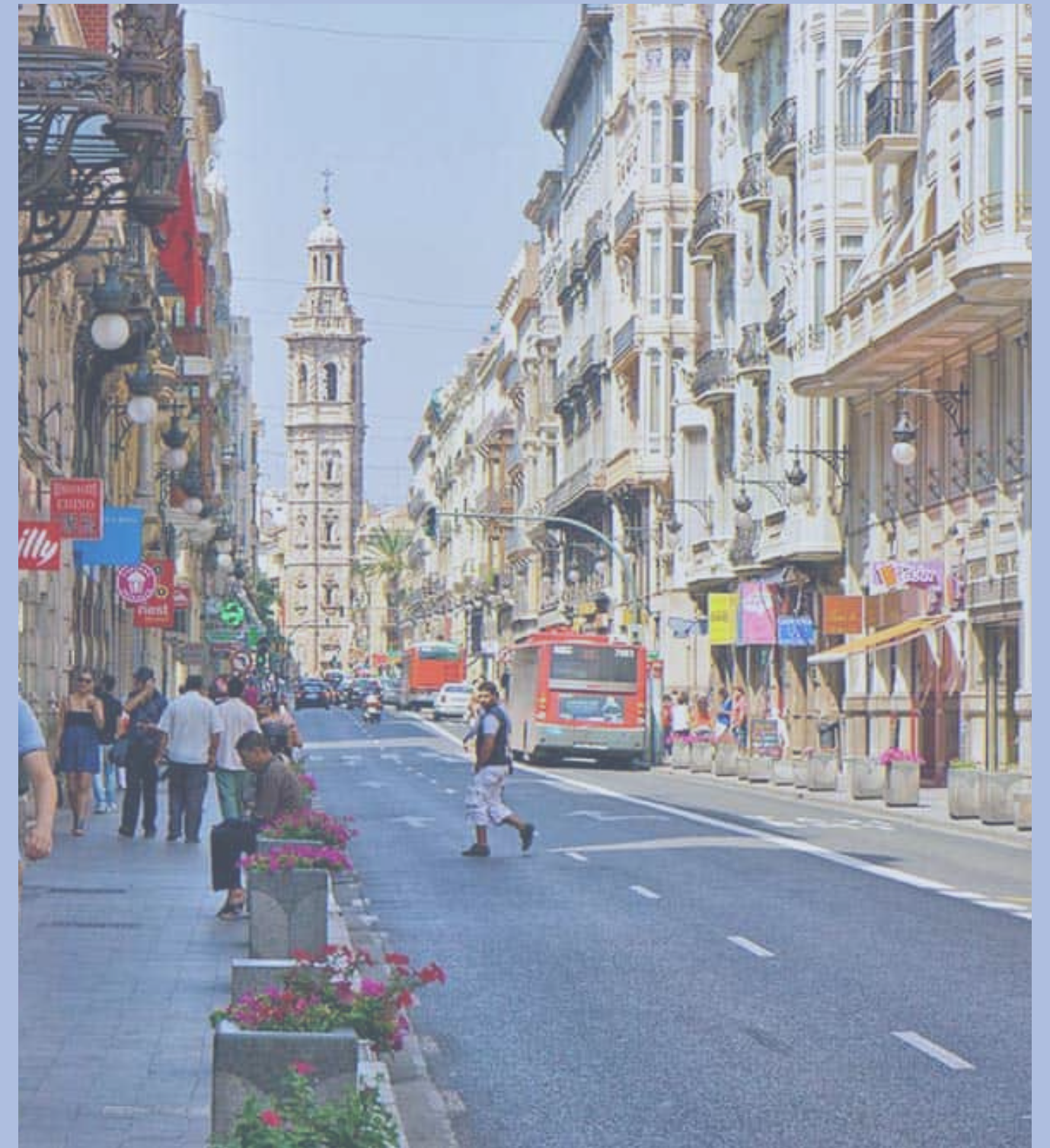
Analyse if energy prices and productions are affected by weather conditions.

Analyse the stability of energy prices, demand and production, and compare different energy production methods.

Data Used

Energy consumption generation prices and weather in Valencia, Spain.

Hourly data from 2015 to 2019.

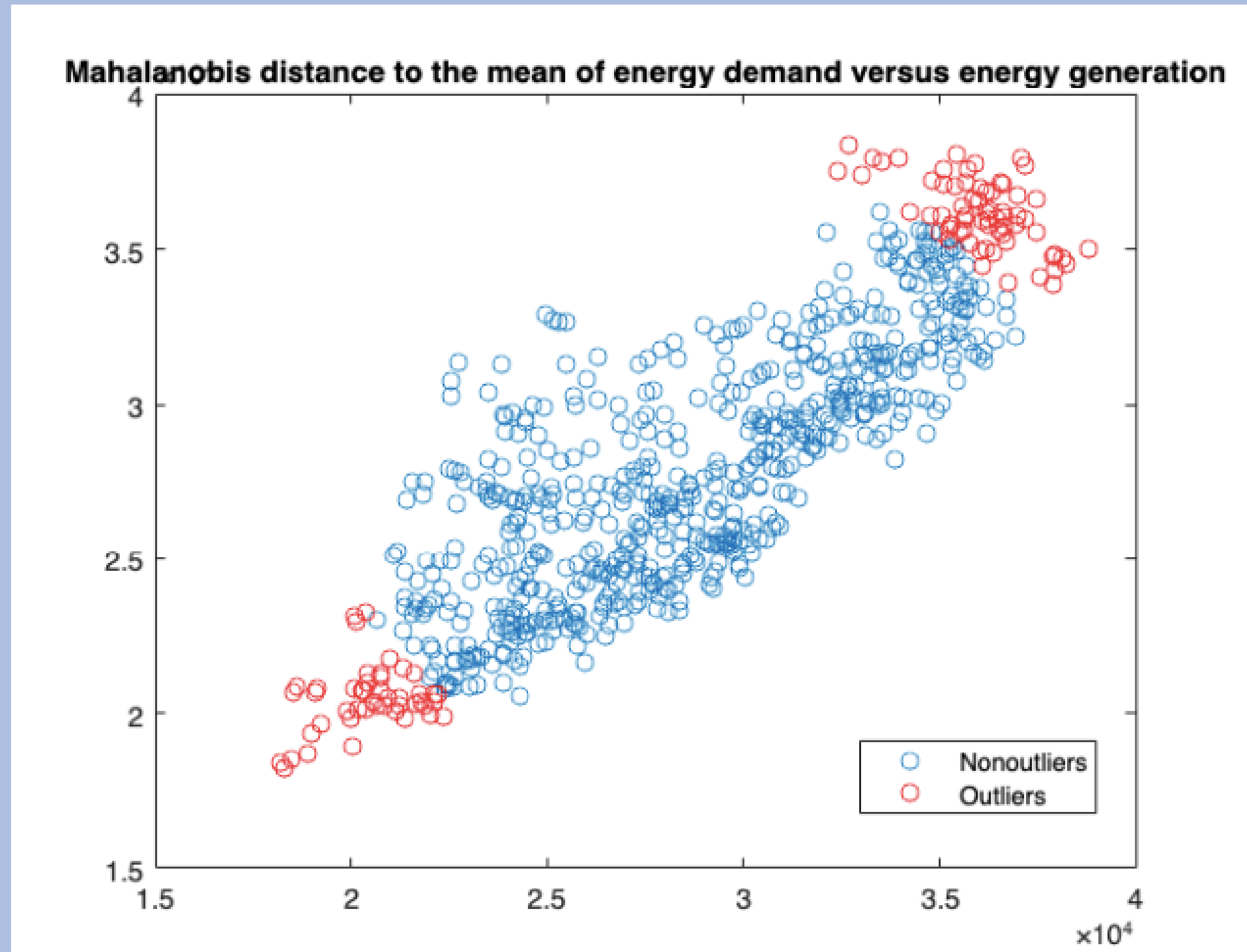


Data Used

14 different methods for generating energy.
Total energy generation.
Energy demand and energy demand prediction.
Energy price and energy price prediction.

35000 data entries or rows (original dataset: hourly)
720 data entries (last month)
1460 data entries (daily)
48 data entries (monthly)

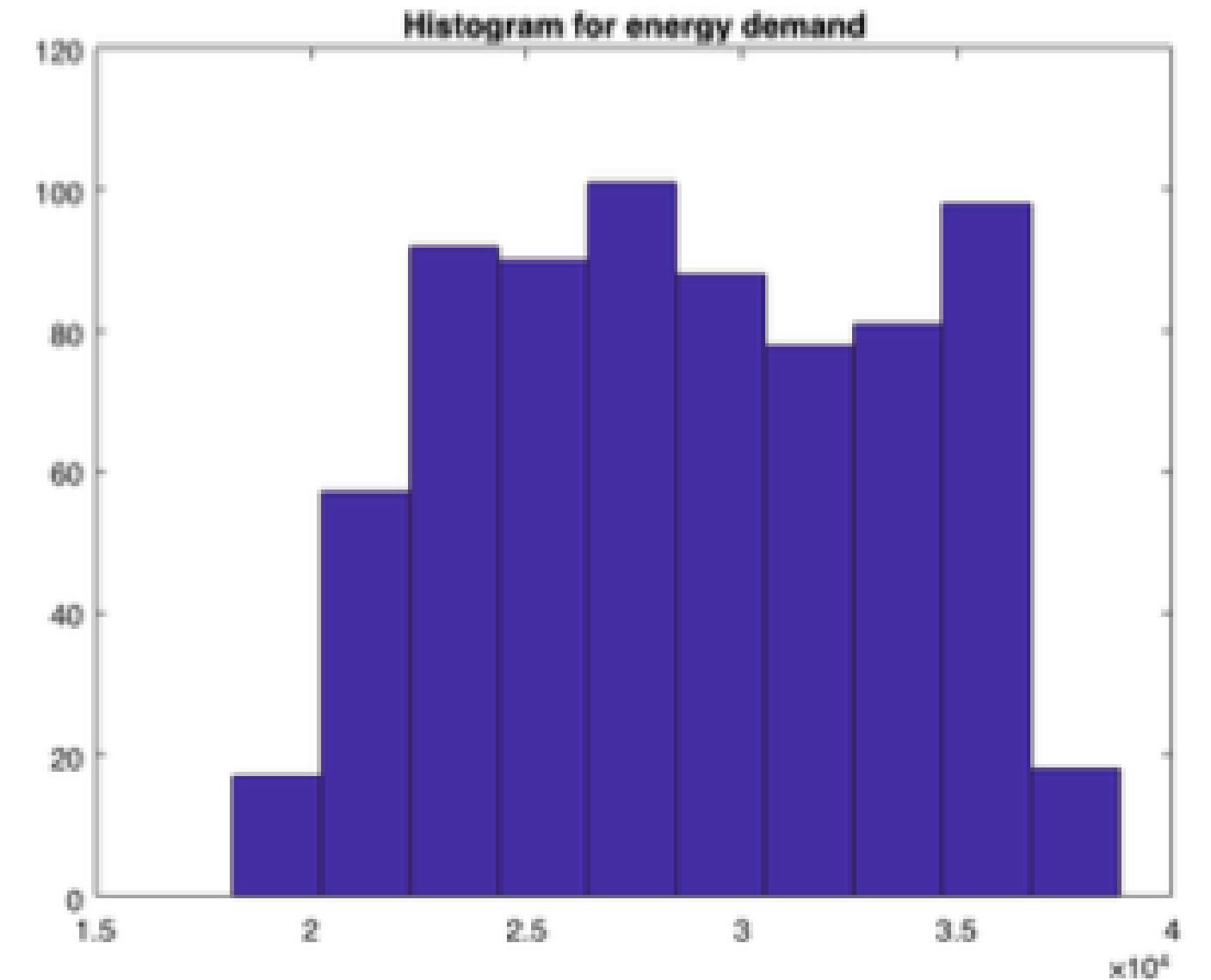
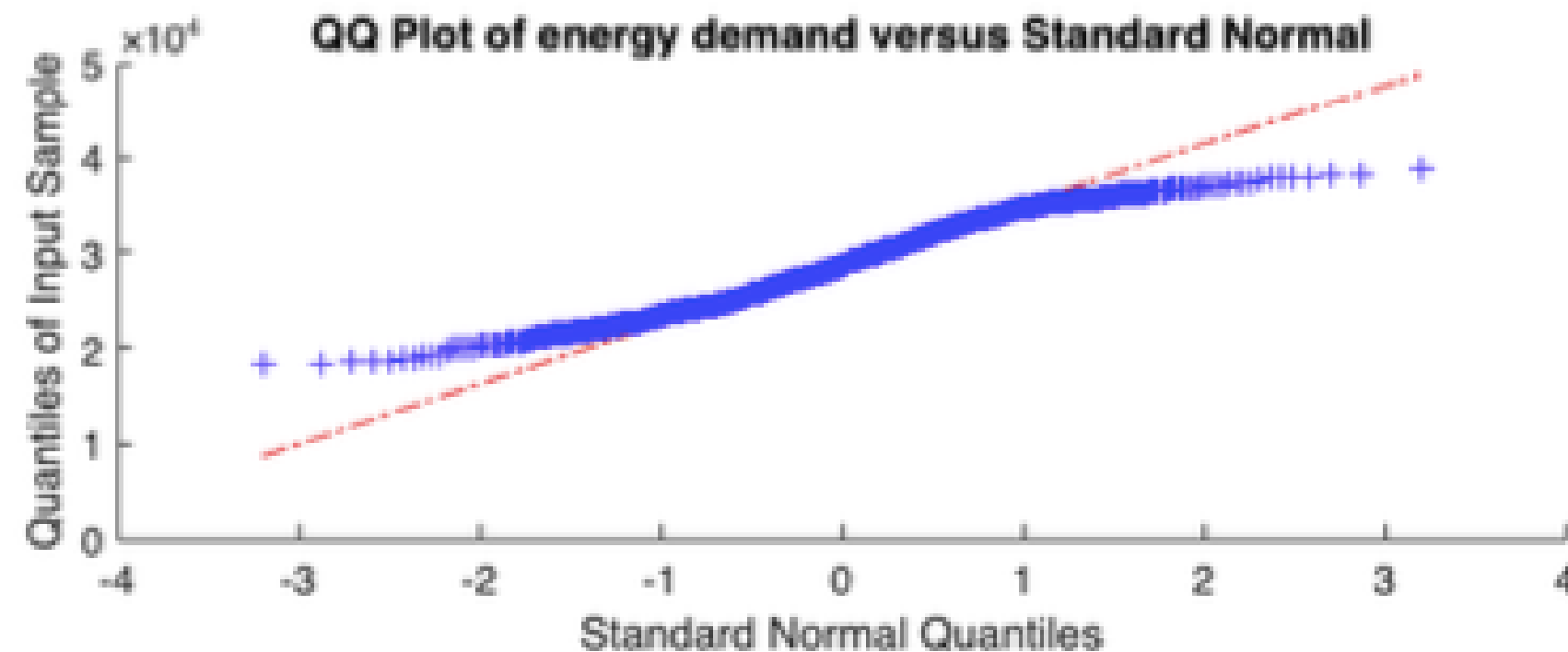
Mahalanobis' Distance to detect outliers



*For data720

Data Distribution

Under dispersed data
Beta Distribution (uniform distribution)

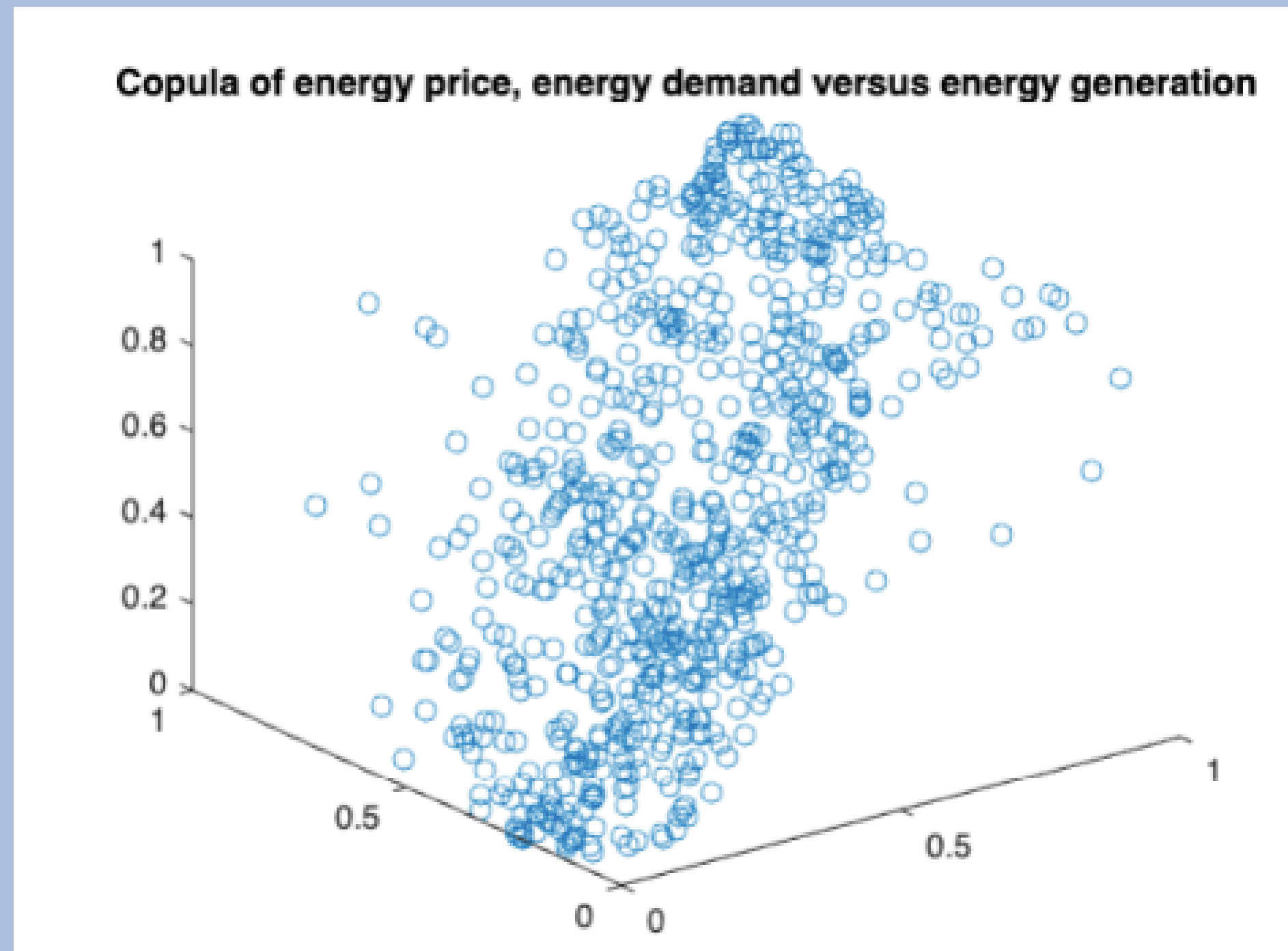


Similar distributions were found for energy generation

*For data720

Data Dependency

Multivariable Copula

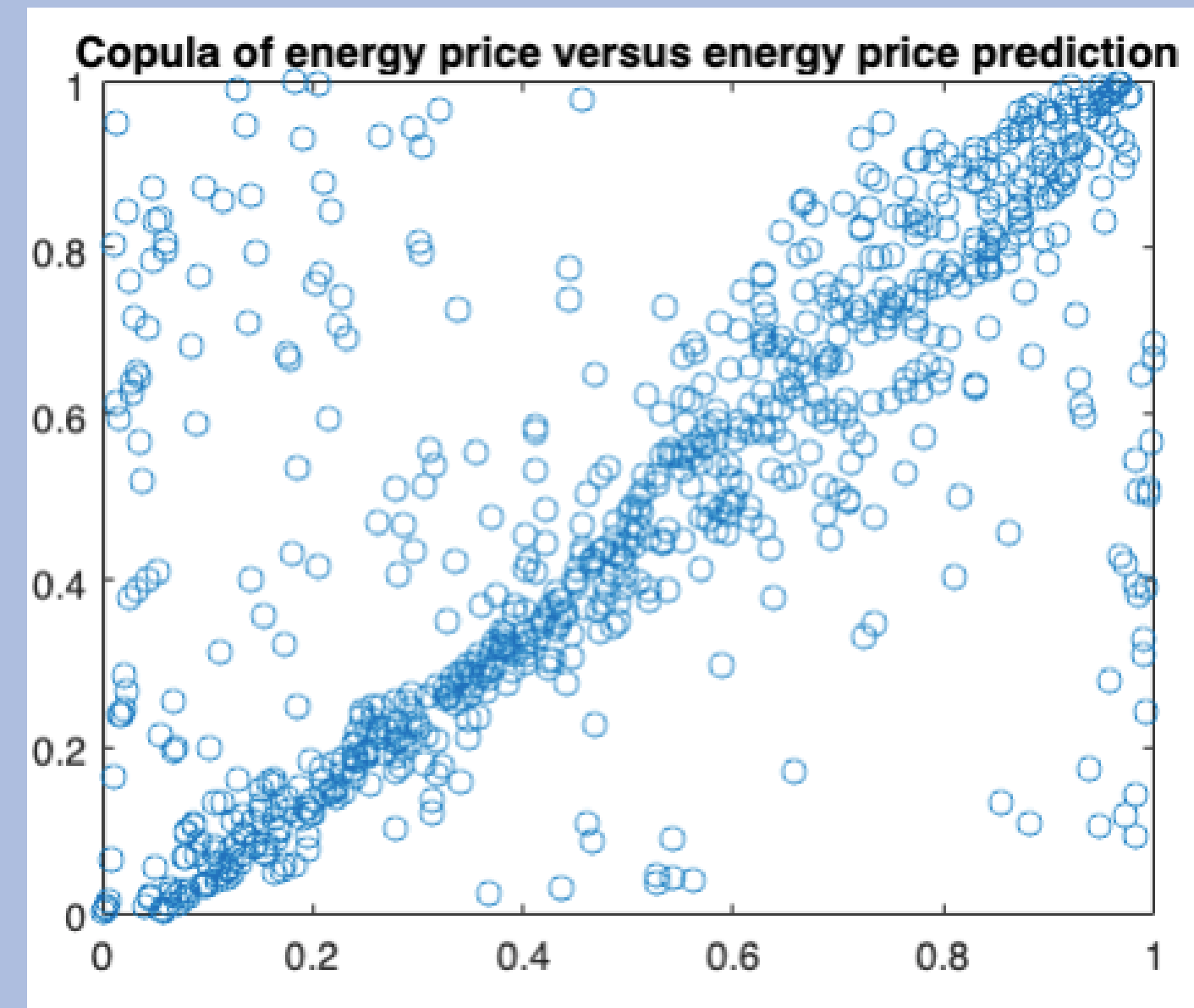
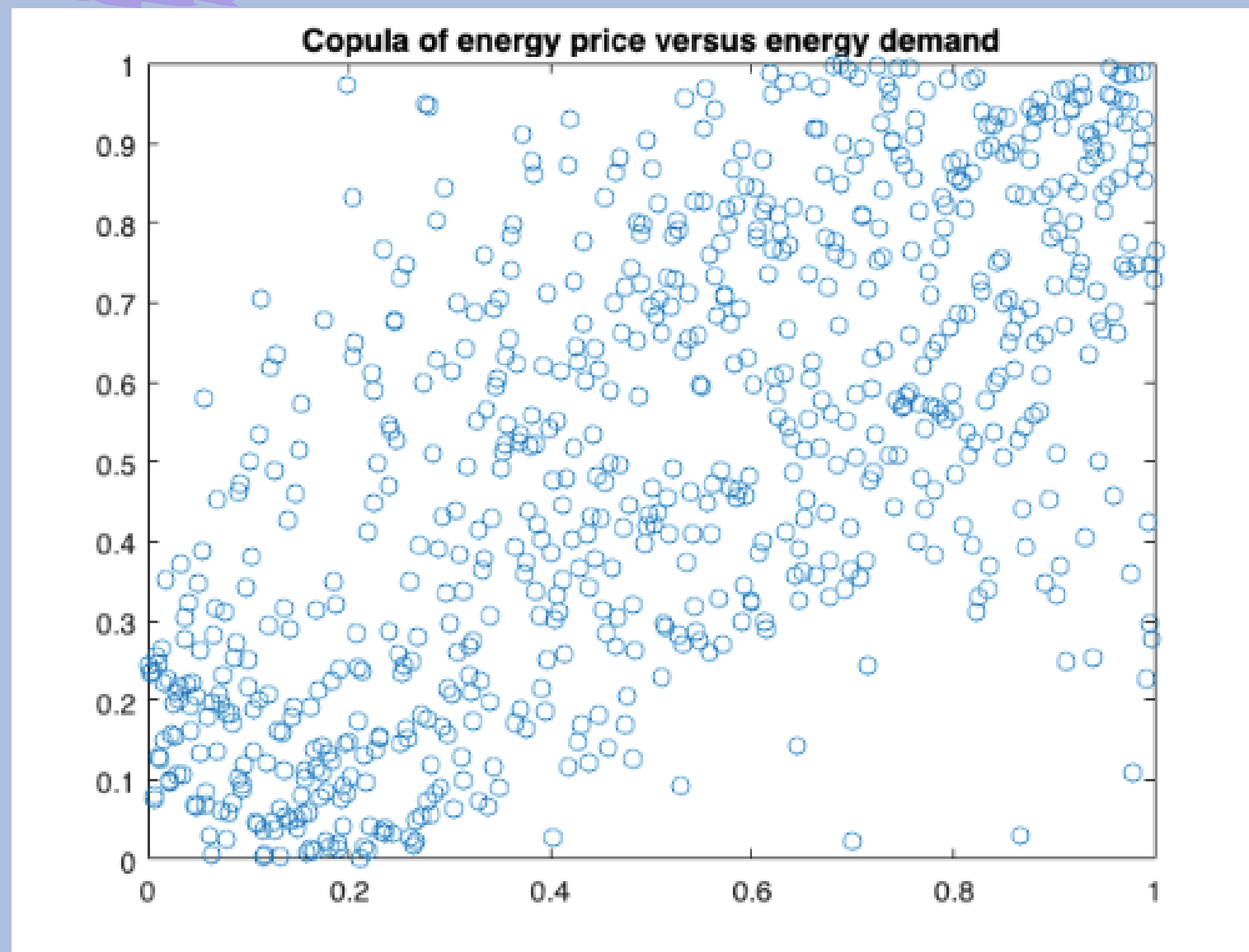


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Data Dependency

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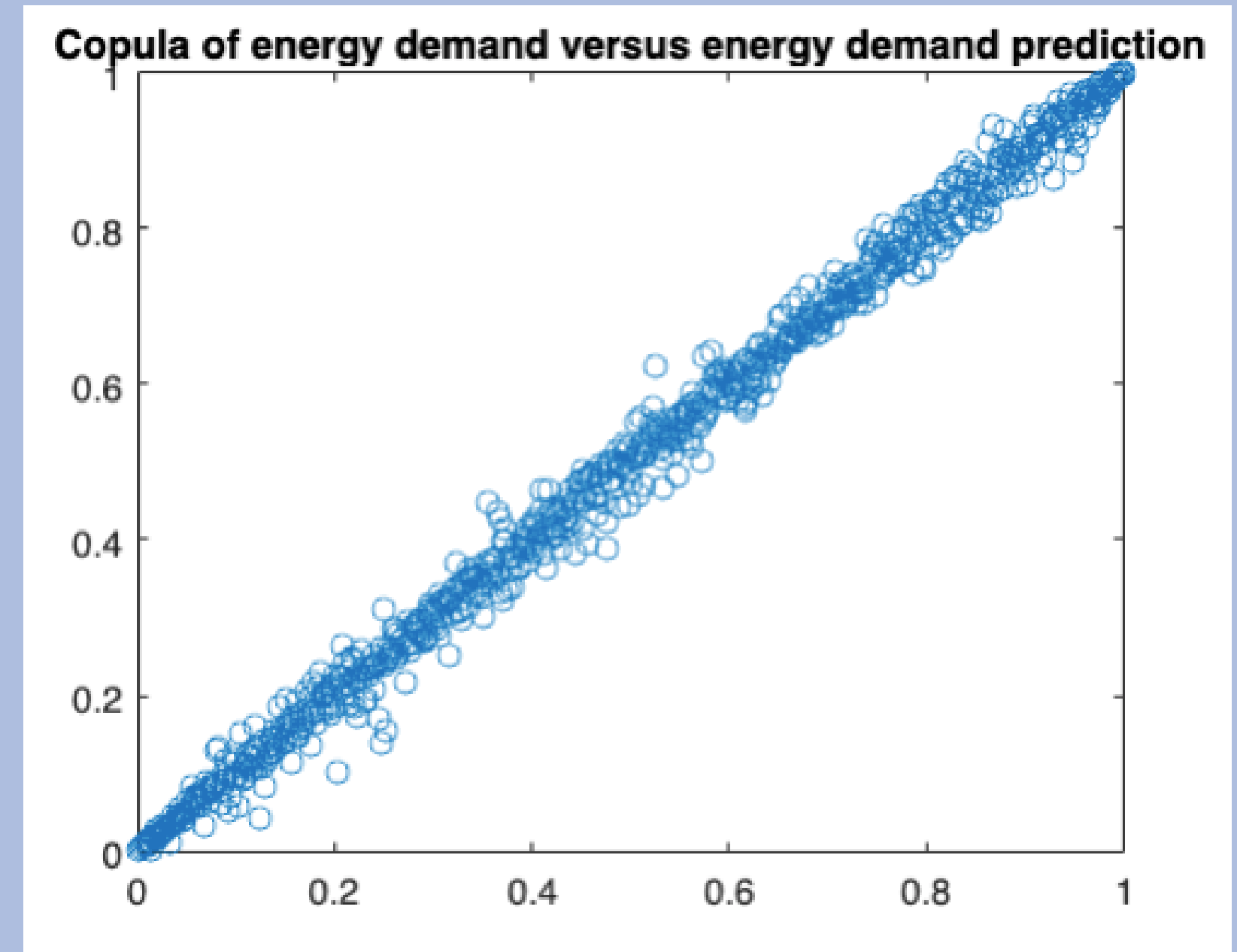
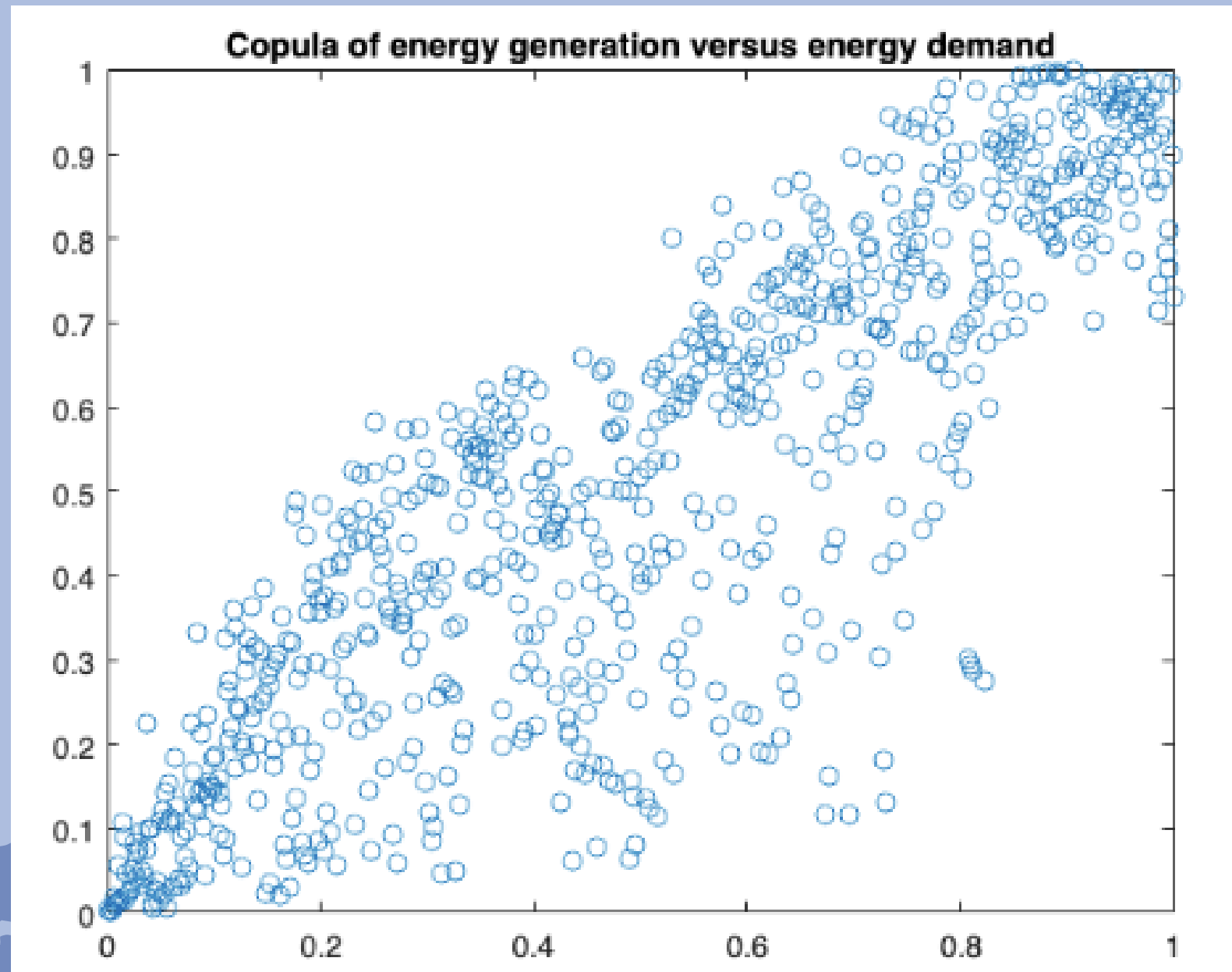
Bivariant Copula of the empirical distributions



Data suggests there is not much Elasticity

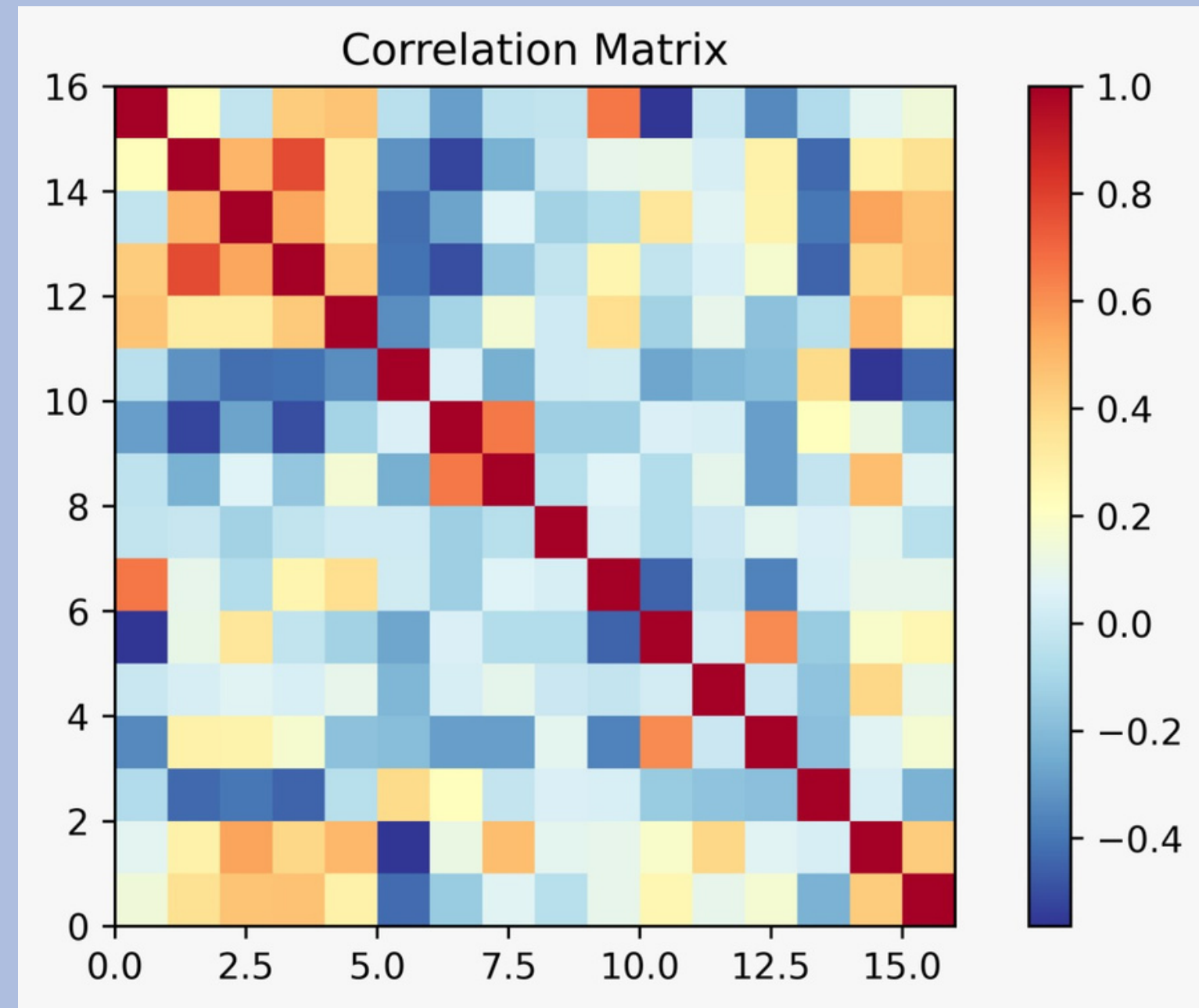
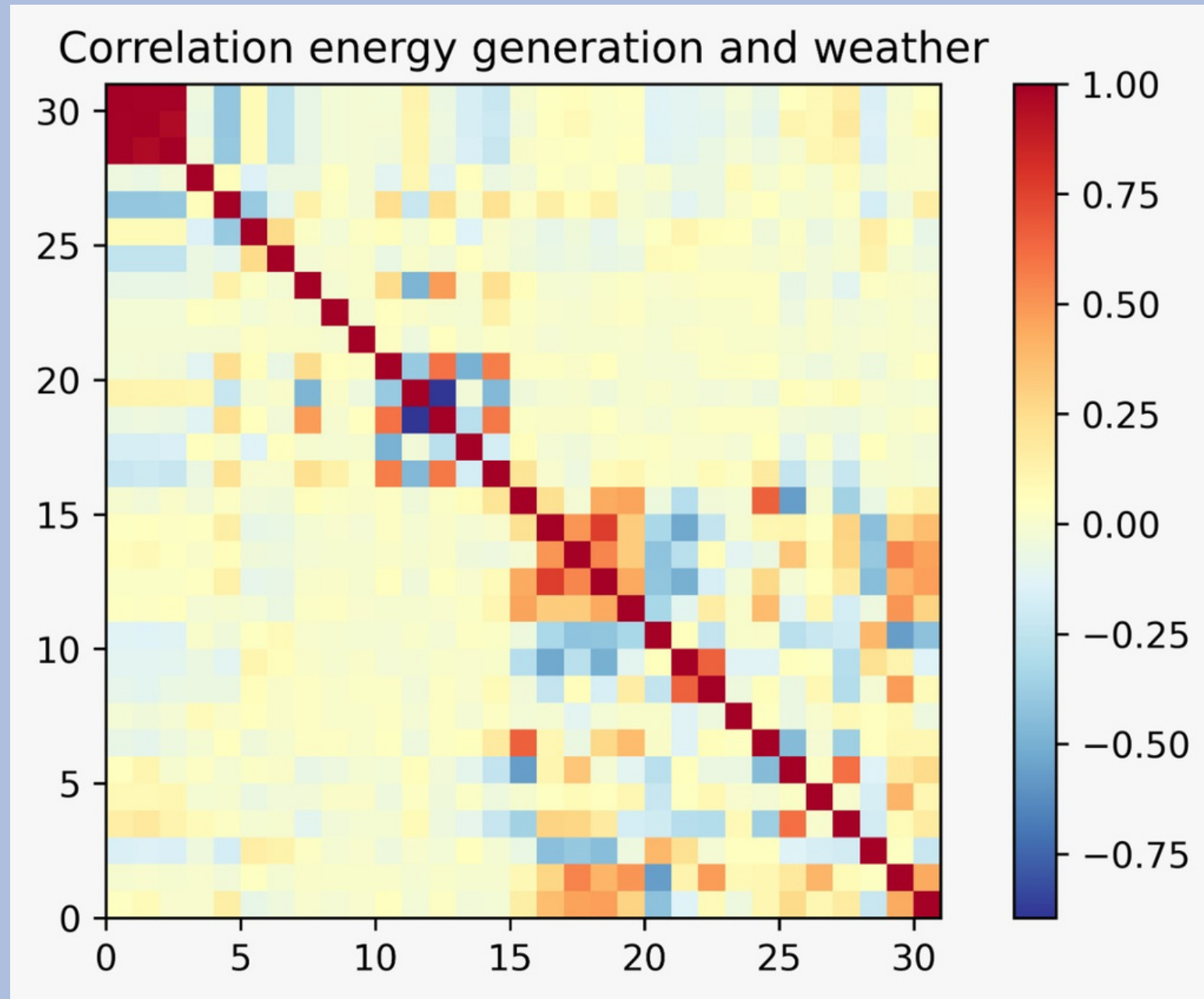
Data Dependency

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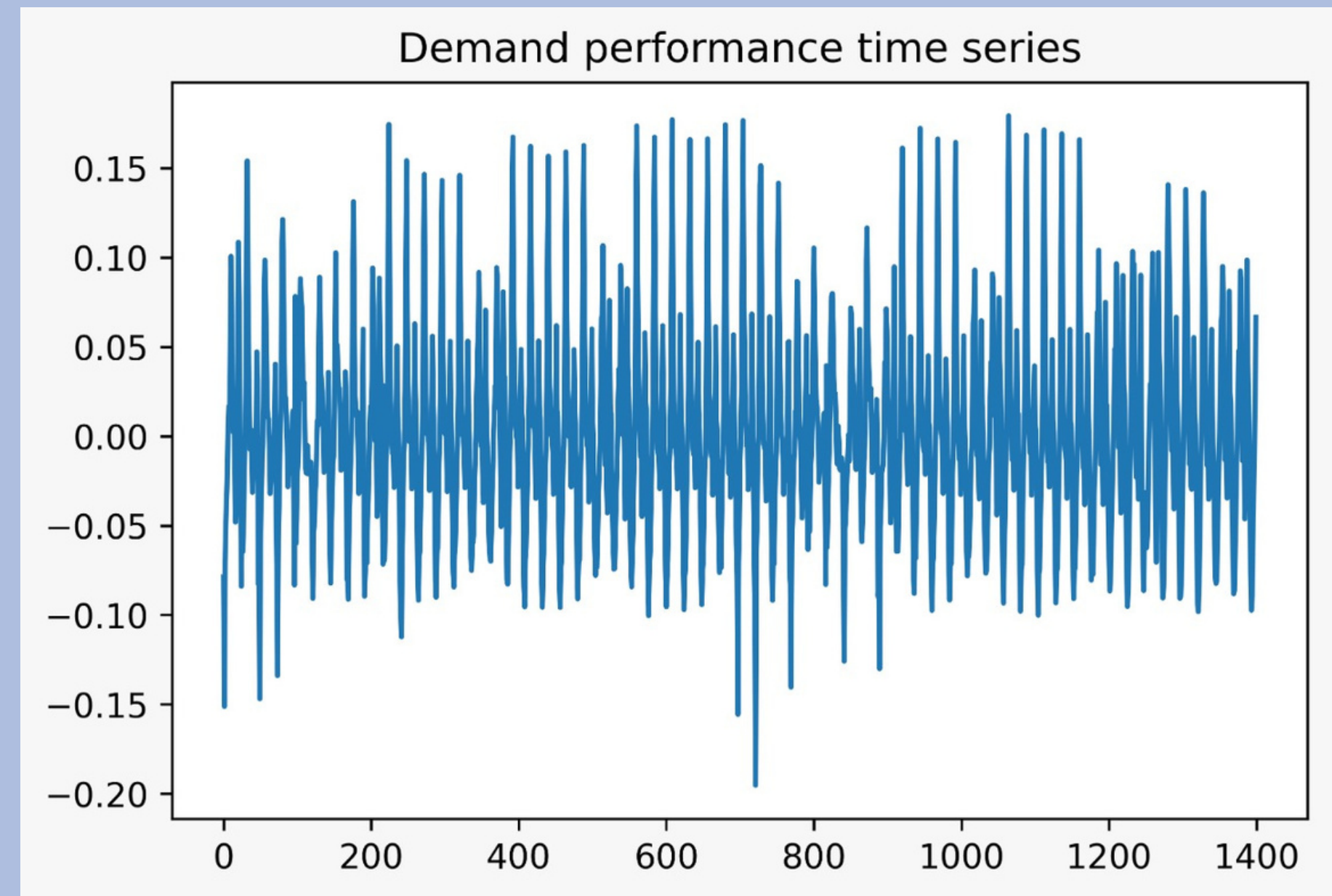
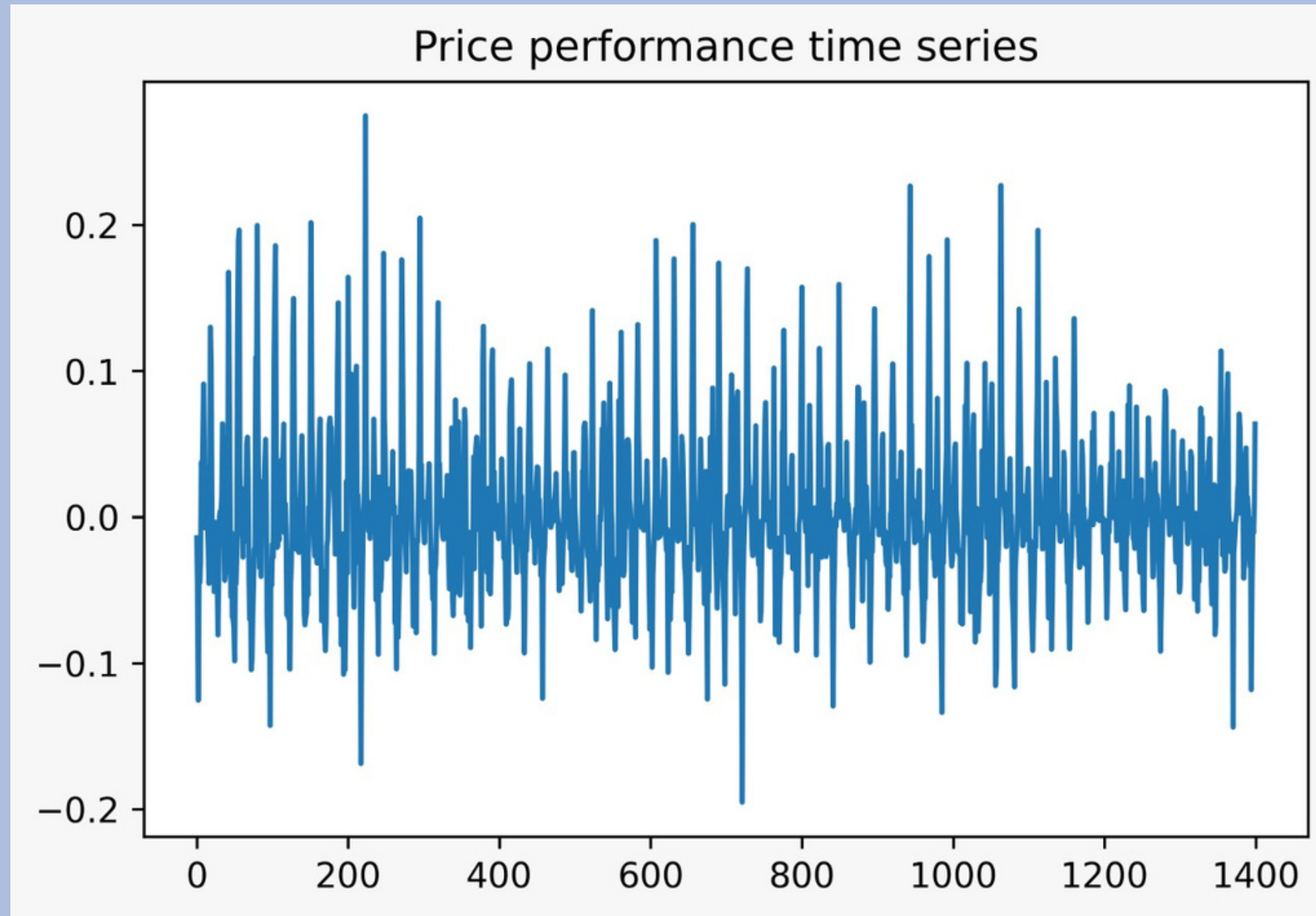
Data Dependency

Multivariable correlation coefficient



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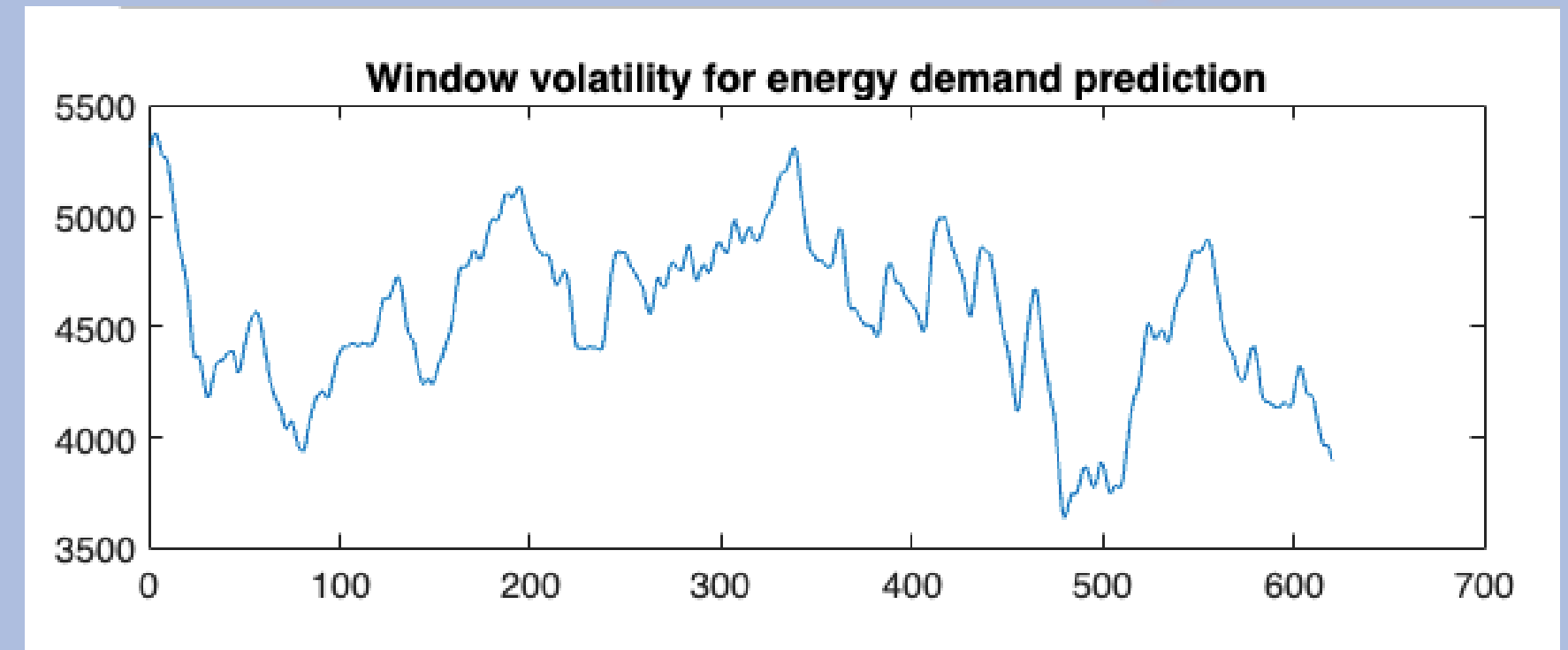
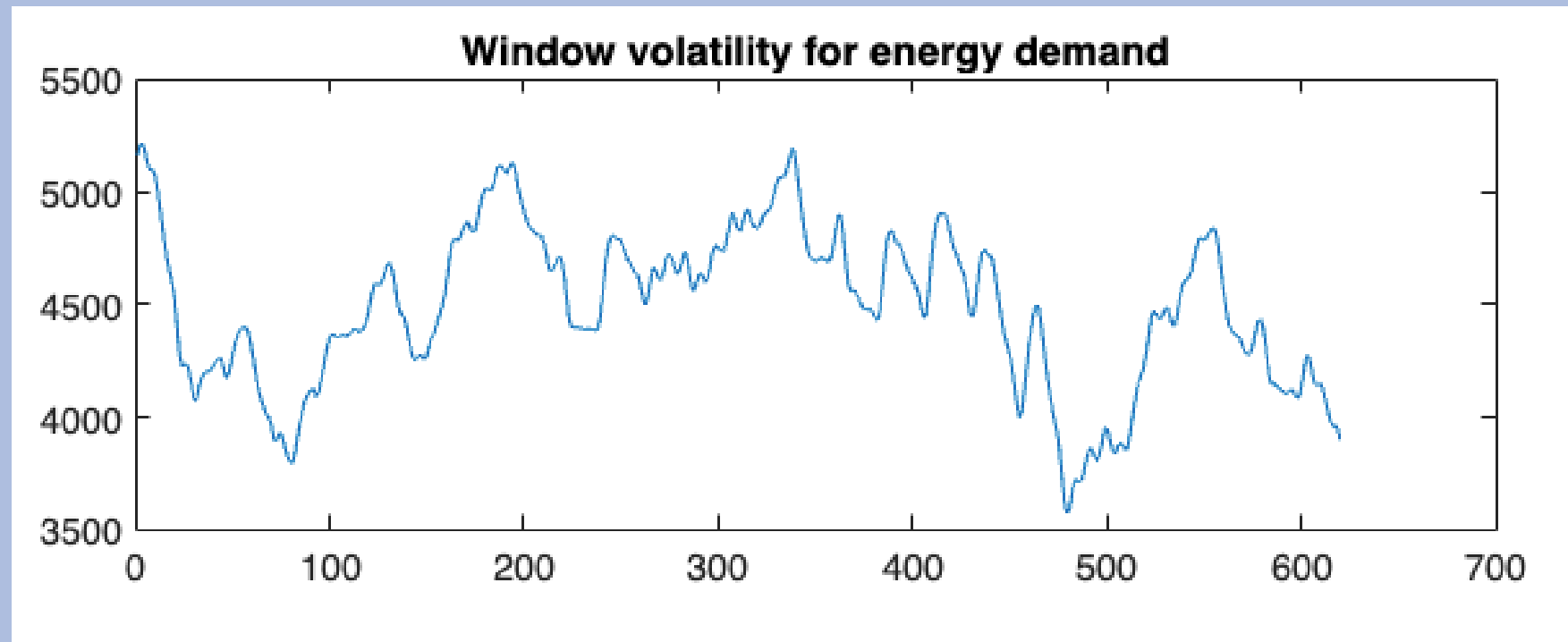
Performance



*For data35000

Data Stability

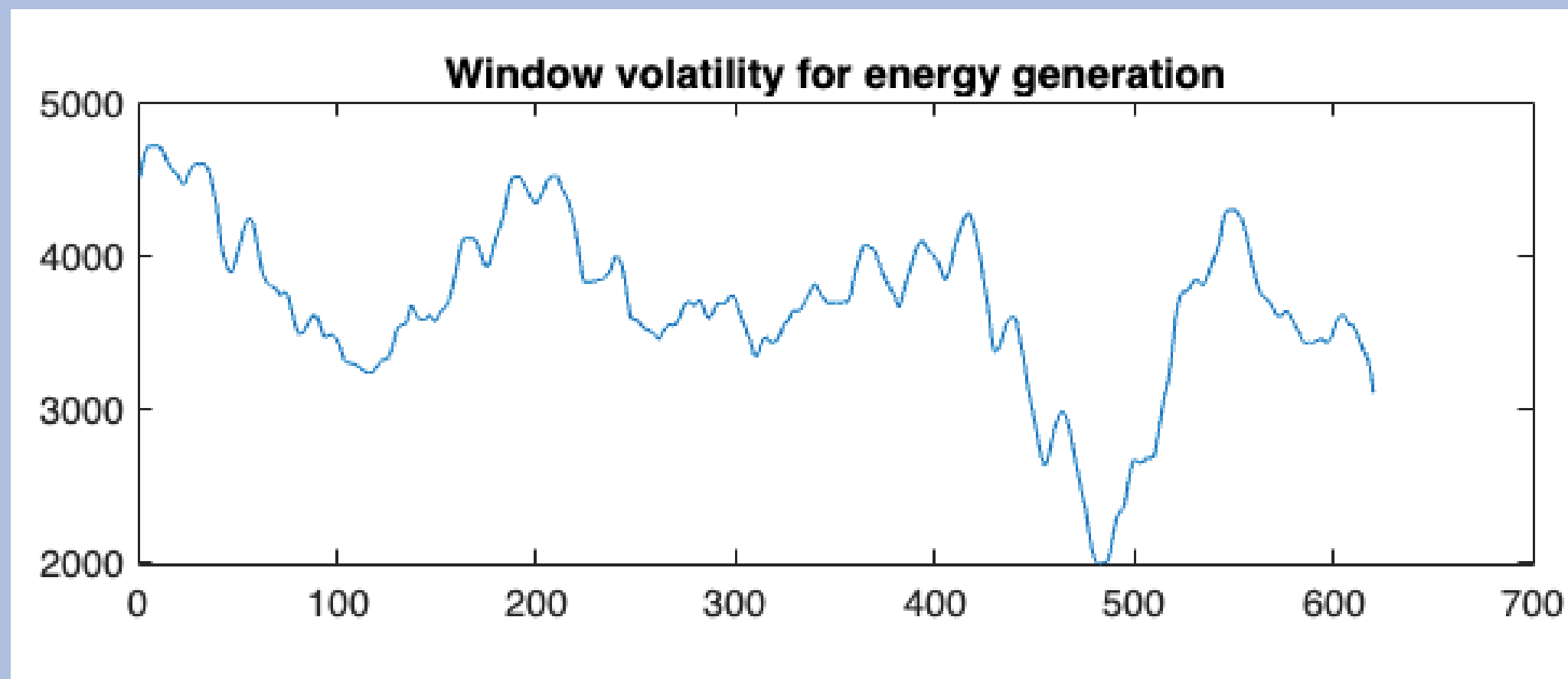
Is energy production a stable process?
Technique used: Window volatility



*For data720

Data Stability

Is energy production a stable process?
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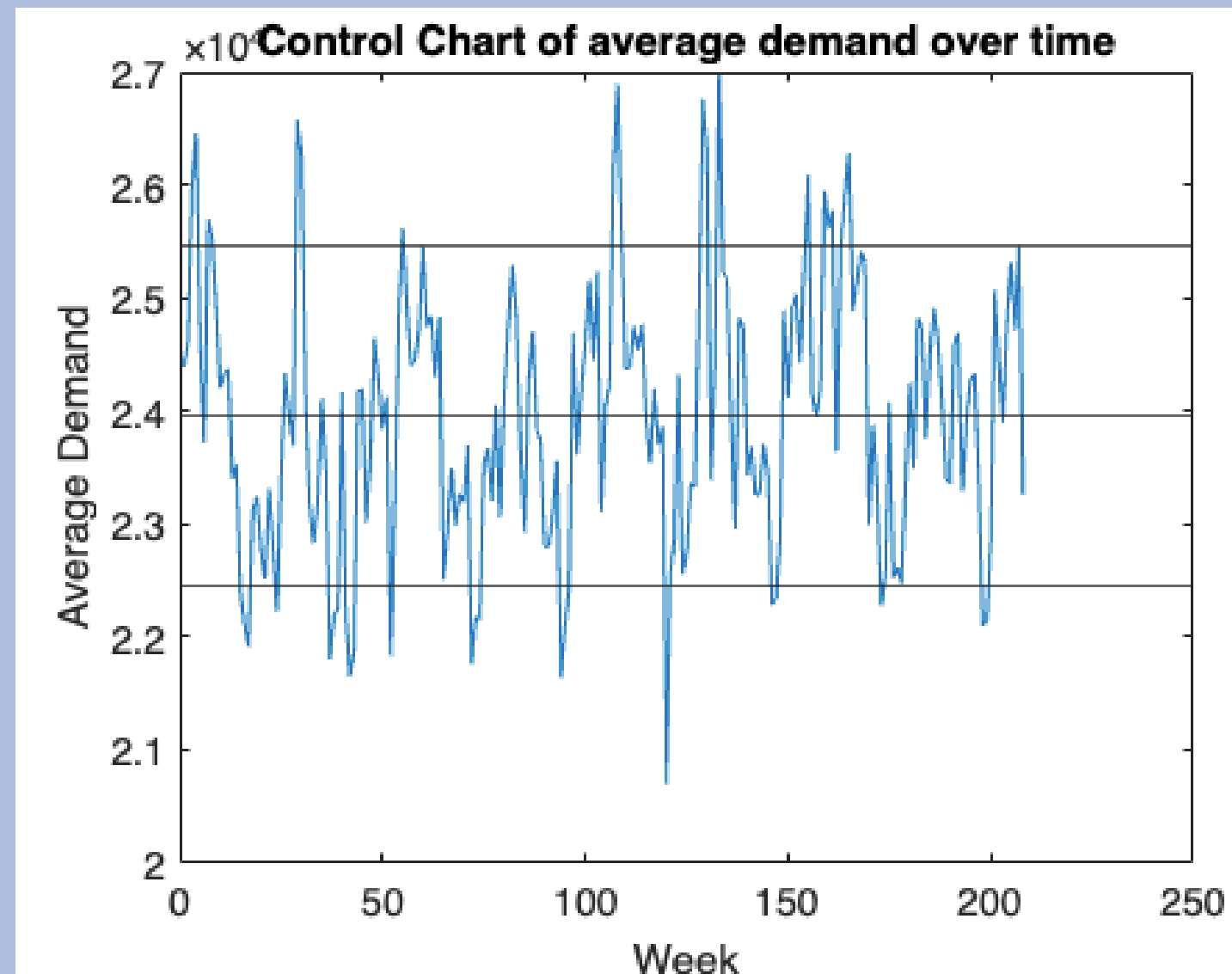
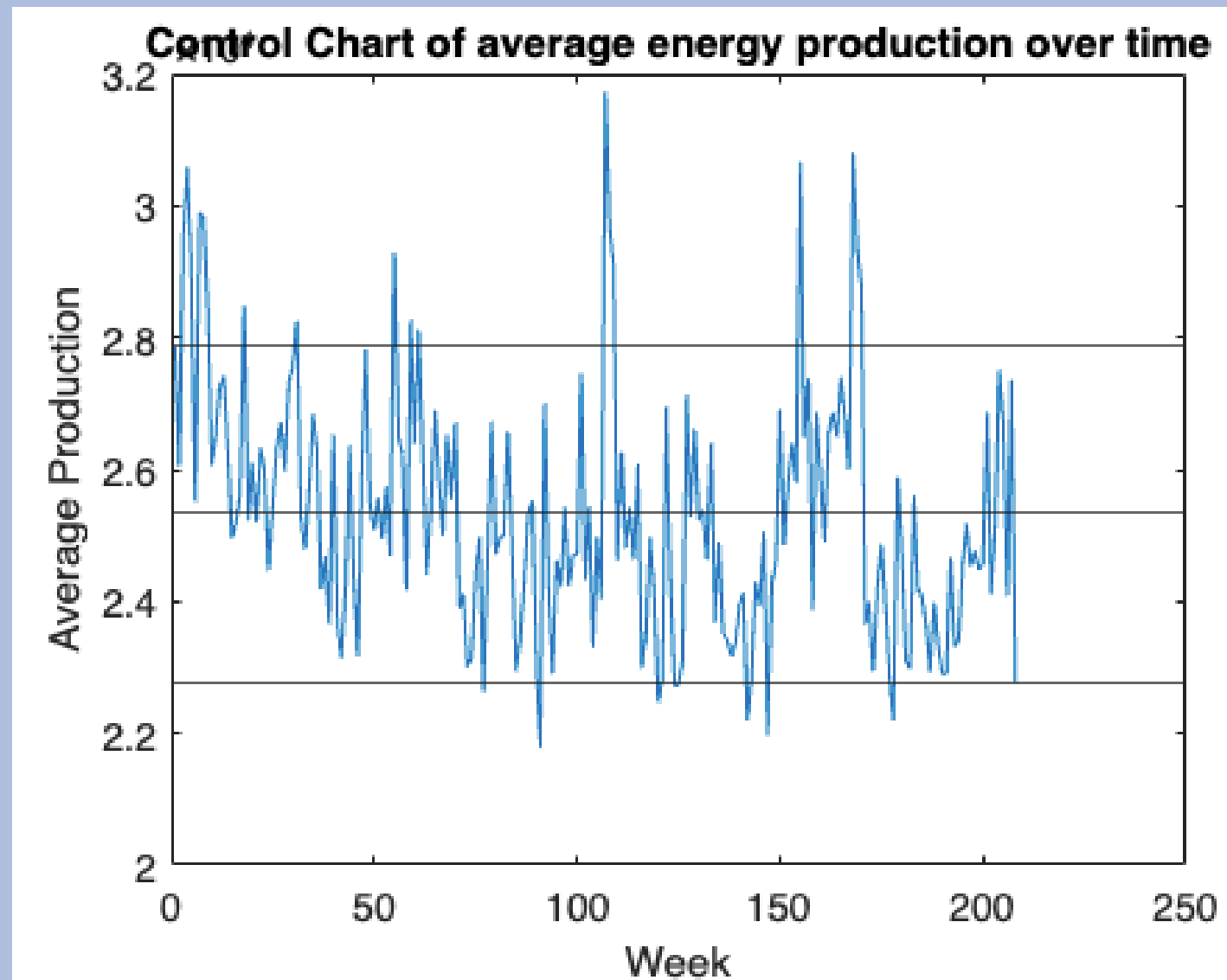


*For data720

Data Stability

Is energy production a stable process?

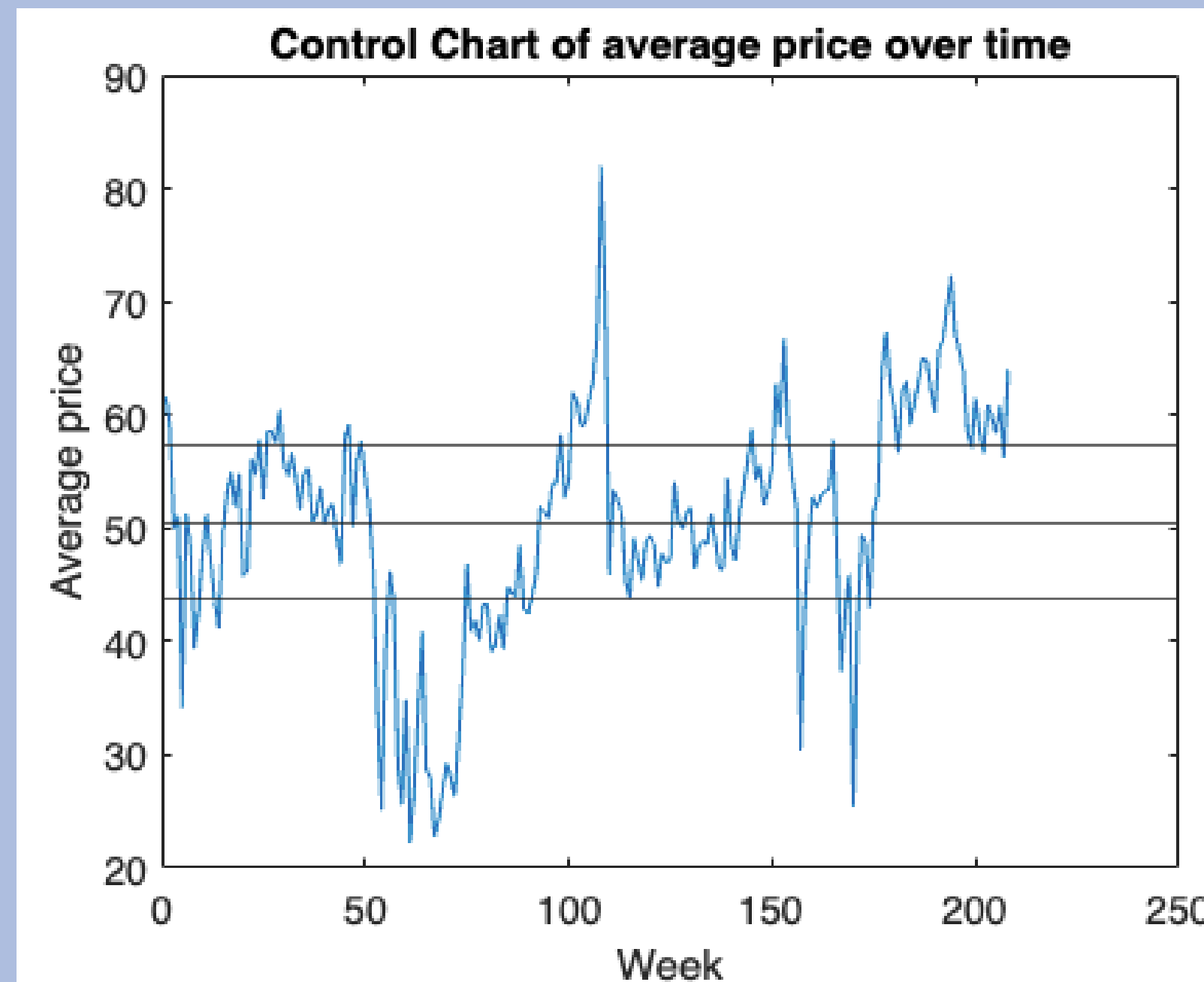
Technique used: Control Charts



*For data1460

Remark!

The analysis was made adding every method to get energy, not every method as a whole.



*For data1460

Future Work

- Different methods for finding outliers like peaks over threshold (POT) and extreme value distribution.
- Different methods for finding data dependency like autocorrelation function (ACF).
- Different methods for checking volatility like exponential smoothing.
- Check for data dependency of weather and energy production.
- Attempt to predict energy production and energy price.
- Analyse error between predicted data and real data.

References

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